

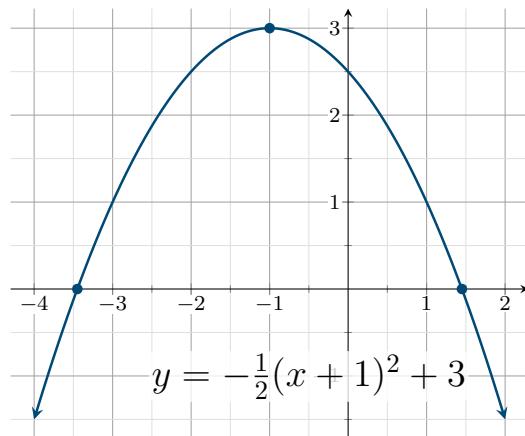
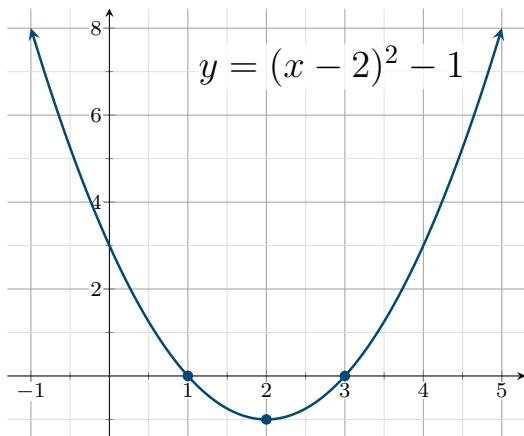
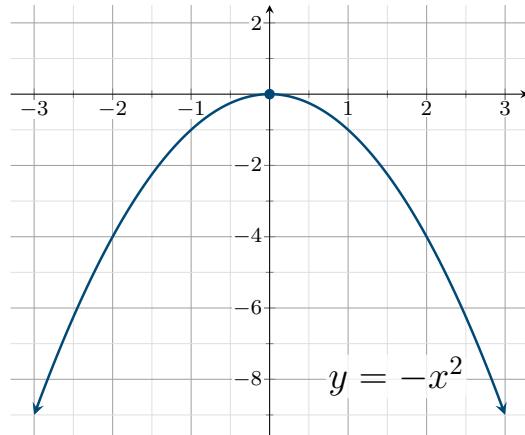
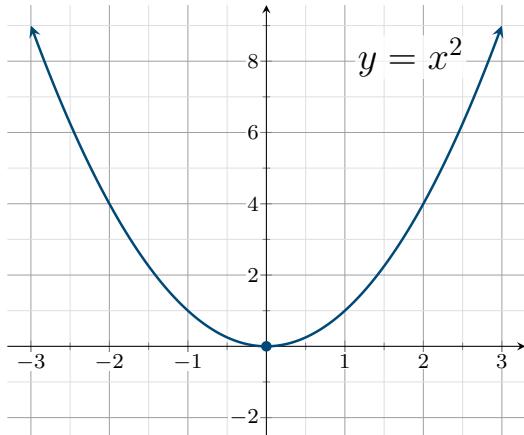
2.2: Quadratic Functions: Parabolas

Definition.

A **quadratic function** has the form

$$y = f(x) = ax^2 + bx + c \quad (a \neq 0)$$

where a , b , and c represent constants. A **parabola** is the shape of the graph of a quadratic function.



Definition.

The quadratic function $y = f(x) = ax^2 + bx + c$ has its **vertex** at

$$\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right).$$

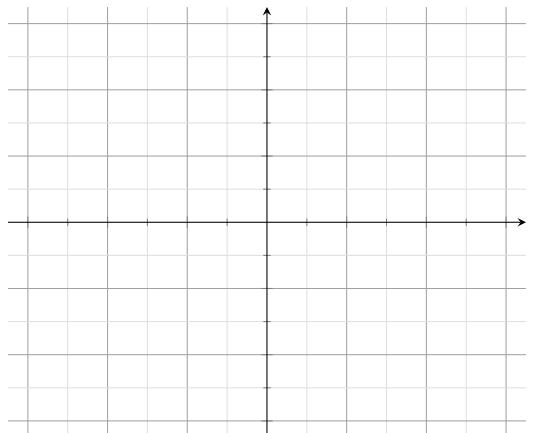
The optimal value occurs at the vertex of a parabola:

- A maximum if $a < 0$ ↘
- A minimum if $a > 0$ ↗

Example. Consider the function

$$2x + \frac{x^2}{2}$$

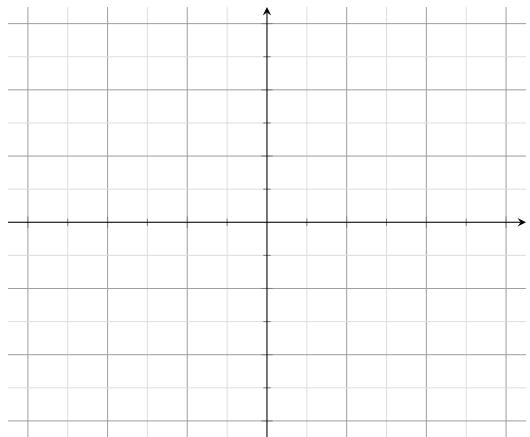
Is the vertex a maximum or minimum? Locate the vertex, x -intercepts, y -intercept, and then sketch the graph.



Example. Consider the function

$$x^2 + 5 - 4x$$

Is the vertex a maximum or minimum? Locate the vertex, x -intercepts, y -intercept, and then sketch the graph.



Example. Ace Cruises offers a sunset cruise to a group of 50 people for a price of \$30 per person, but it reduces the price per person by \$0.50 for each additional person above 50. Find the revenue function. What price maximizes the revenue? What is this maximal value?